importance was the identification of a rift in the snow-cap with the subsequent canal called Jaxartes.

In the opposition of 1900 the Phosin and Euphrates were always seen double, as in 1896. Mr. Lowell suggests that probably the two epochs of gemination of the canals on Mars as laid down by Schiaparelli may not be epochs of gemination, but epochs of greater conspicuousness of the gemination at one time than at another; this would bring apparently discordant facts into line.

During this opposition Solis Lacus was not seen with its usual distinctness, and it is inferred that as it was at its dead season it had turned sear and yellow. White equatorial spots of long duration were an important feature at this time.

The observations of 1903 were very fruitful with results, and special reference should be made to the relationship between the oases and the double canals.

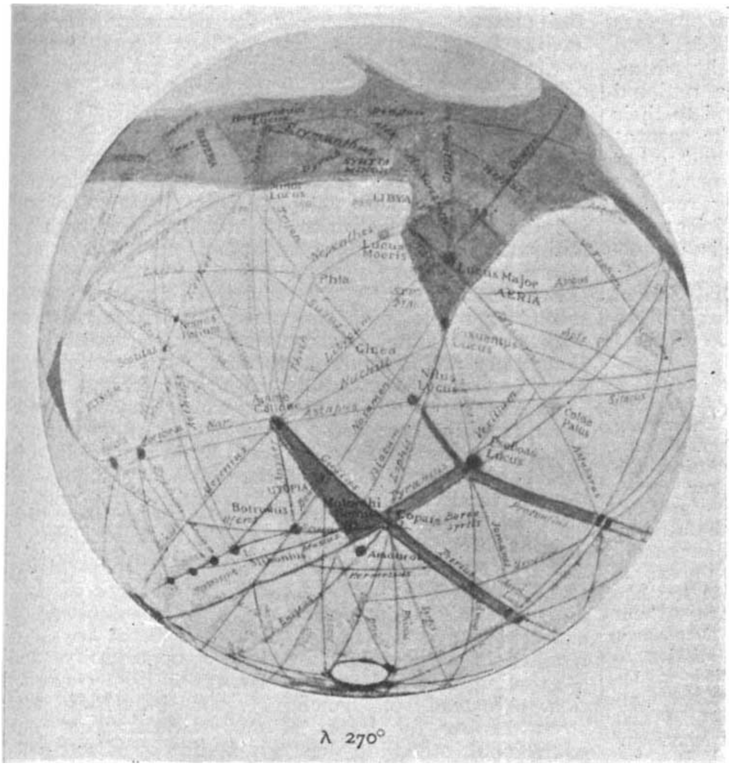

Fig. 3.—The same longitude (270°) as in Fig. 2 from observations made at the opposition of 1903 (Lowell).

The reader should also direct his attention to the semi-annual flux in the development of the canals which was revealed, showing that two waves of development sweep alternately over the planet's surface in the course of one of its years, this being clearly illustrated in Lowell's cartouches.

Regarding the appearance of cloud on the planet's surface, Mr. Lowell is inclined to think that the large, whitish marking named Hellas to the north of Syrtis Major represents either mist or cloud. In the opposition of 1901 it was never seen as white as the polar cap, although it approximated to it more than to all the regions outside of it. He was thus led to believe that it was not formed of snow, but of "something which would thus hold an intermediate position between snow and ground, namely, cloud or mist."

Another, among other references to cloud, is mentioned at the opposition of 1903, in relation to the region about the Mare Acidalium and the pole, this region being obscurely semi-white. On January 23 Mr. Lowell wrote:—"No sharp limit to polar cap. Think it surrounded by spring cloud."

Many other points of interest in connection with these and similar observations might be dwelt on at some length, but the reader must be referred to the volume itself for a more intimate study.

In addition to a good index to the volume, there is a special index of the names on the maps and globes. In the latter there are fifty-four regions, 392 canals, and 172 oases mentioned, which will give the reader some idea of the number of Martian markings seen at Flagstaff.

In addition to the frontispiece, which is a reproduction from a photograph of the 24-inch equatorial, there are thirteen plates and seventy-six illustrations in the text, all of which are of first-class quality.

Printed in large, clear type on smooth, stout paper, and occupying about 350 pages, the volume contains a valuable increase to our knowledge of Mars, and forms a handsome addition to the astronomical library.

On the production of this volume Mr. Lowell and his staff are to be sincerely congratulated, the more so that since its publication success has rewarded their endeavours in recording the canals of Mars on a photographic plate (Roy. Soc. Proc., Ser. A, vol. lxxvii., p. 132).

William J. S. Lockyer.

THE PLACE OF THE MODERN UNIVERSITY IN THE STATE.

The recent quatercentenary celebrations of the University of Aberdeen, and especially the speeches of the venerable Chancellor of the University on that occasion, again direct the attention of thoughtful men to the vital connection between national efficiency and well-being and the provision made by a State for the higher education of its people in modernised universities. The presence of the King and Queen to open the new buildings at Marischal College serves admirably to accentuate the fortunate fact that in their endeavours to provide this country with institutions adequately equipped to supply instruction of the highest grade and with facilities for research in all departments of knowledge, our statesmen, our men of science, and our men of wealth are receiving some of that encouragement of their efforts which it is the power of our Sovereigns to bestow.

The brilliant gathering of learned men eminent in every sphere of human endeavour, and representative alike of science, art, and letters, may be taken as a happy augury of the unanimity that prevails to spare no effort in the pressing work of supplementing and extending the supply of seats of the highest learning in every part of the country, with a view to place Great Britain on terms of equality with other great nations in the keen competition which is the outstanding characteristic of international relations at the beginning of the twentieth century.

With these evidences of educational enthusiasm and endeavour before us, it seems a fitting opportunity to consider briefly what appears to be the current plan of procedure and to inquire how far this is likely to meet the prevailing needs. Enthusiasm, unless well directed, is not enough. British educational endeavour has too often proved unproductive because of its haphazard character, and instances are extant where in neighbouring countries better results have followed a smaller expenditure of money and trouble, because each new development has made an addition to a carefully conceived plan. The policy of muddle is, at all events, fatal in education.

There must, in the first place, be an intimate connection—a close association throughout, indeed—between the systems of elementary and secondary education on one hand, and the colleges and universities on the other. The trinity of grades must form an organic whole dominated by the same ideals, imbued from base to apex with the same spirit of earnest thoroughness, where at every stage the learner must be taught to be content with nothing short of the best. A boy's opportunities for progress should be limited only by his natural aptitudes; and brains, wherever found, must be regarded by educational administrators in every district as a national asset to be trained, developed, and sharpened to their full extent. How far this is from being the case at present many recent articles in NATURE and other contributions to current literature have shown. Not only is the amount of preliminary training received by boys seeking admittance to college insufficient, but the kind of education they have received is unsuitable.

The principal of the Manchester Municipal School of Technology, who is particularly well qualified to speak on this subject, wrote in an article (*School World*, April) published this year:—

> "Those who are familiar with the standards of entrance to our advanced schools and colleges of science know only too well how low are the standards of admission. Whatever may be the 'face' requirements of matriculation, the actual marks required for a pass are extremely low, necessarily so in the present state of our secondary education. It is further well established that the average time actually spent in the secondary schools is not much, if any, more than a third of that required in German and Swiss schools of similar rank—in short, either the pupils go in too late or they finish too early. In any event, they leave without an adequate training, alike in respect of both time spent and subjects studied. Moreover, the age of admission to our universities and specialised schools of applied science is two years below that of similar institutions on the Continent. In these circumstances, how is it possible that the output, in respect of the quality of the students, can rival that of foreign institutions?"

Commenting upon the kind of secondary education given in this country, a writer in NATURE of March 23, 1905 (vol. lxxi., p. 487), states:—

> "The custodians of English education are still actuated by mediæval ideals. The entrance of the student of science to the older universities is still obstructed by an obsolete and ludicrous test in Greek. There is a tendency even yet among those in charge of our Department of Education to discourage and hamper the instruction in science in our elementary and secondary schools."

Lord Strathcona did well to emphasise in his address at the Aberdeen graduation ceremony the stimulating influence which Scottish universities have had upon the schools of that country, for it is especially to the improvement of the type and standard of English secondary education that attention must be at once seriously directed if full advantage is to be made of English universities and technical colleges. We have arrived at the stage when the pressing need is neither suitable buildings nor qualified teachers—these we have in a more abundant measure than is necessary to meet present needs—but students suitably prepared and thoroughly grounded in the fundamentals of a sound secondary education. The number of day students in our technical schools and colleges is still ridiculously small, and too many of those in attendance are reaping little benefit, because they lack habits of serious study and the acquaintance with fundamental principles they should have acquired at school. It is in this direction that immediate improvement is required. In Germany, to quote an example of what can be done, the secondary schools are turning out youths trained to think and to reason, trained in the methods of acquiring knowledge, and inspired with an earnest desire to study the subjects necessary to enable them to occupy positions of command in their country's industrial army. But the German boy is, as a matter of course, allowed to remain at the secondary school to the age of eighteen or nineteen, and parents willingly make the necessary sacrifice, having learnt how abundant in later years is their reward. In some way or other, if we are to compete on anything like equal terms with other nations, we must import a spirit of greater earnestness into our secondary schools, allow our boys to remain in them longer, and adjust our curriculum to modern needs. The British boy, if rightly directed, has no superior in ability, earnestness, and intelligence generally, and it is little short of criminal to handicap him with an antiquated course of study and a curtailed school career.

But it is not only the bonds which connect the secondary school with the university which must be drawn closer and strengthened; the systems of elementary and secondary education must be rendered more interdependent. Our capacity-catching machinery has improved in recent years, it is true, but it is far from perfect; and the endeavours made to open a way for boys of exceptional brain-power in the elementary school, through the secondary school, to the university, have been spasmodic and not in accordance with a carefully thought-out scheme. Indiscriminate scholarship giving has in many cases resulted only in the manufacture of surplus clerks and ill-trained schoolmasters, and the absence of clear aims and a definite policy as to what education is expected to accomplish for these exceptional boys has resulted in waste of money, loss of opportunity, and a growing disbelief in the efficacy of higher education. Instead of benefiting our industries and strengthening the hands of our manufacturers, our educational muddling has given rise to discontent, whereas a policy of clear thinking and the application of the methods of science to educational problems would have produced a well-balanced and judiciously graded system of national education—capable of providing the country with trained workers for every sphere of activity.

Equally striking would be the effect on the universities themselves if such a coordinated scheme of education could be brought into being. Instead of the glorified boarding-school type which at present functions as a university, where young men continue to play games and practise "good form" to the exclusion of serious work, all our universities would be institutions filled with well-trained youths earnestly intent upon acquainting themselves with the triumphs accomplished by modern research, and upon fitting themselves in their turn to extend the bounds of knowledge.

Lord Strathcona in his address at the graduation ceremony also wisely insisted upon the national character of the Scottish universities, and brought into high relief a feature which should distinguish all modern universities. It is too often forgotten in this country that the provision of universities is primarily a national obligation, and that the State which is content to leave to private initiative and to individual generosity the all-important work of raising and endowing seats of the higher learning is neglecting one of the most potent means for securing its own vitality. The recognition by statesmen of this national duty need not discourage local effort and enthusiasm; indeed, experience tends to show that both are quickened in districts where such State universities are established. The duty has been fully recognised by foreign Governments, and the lavish generosity of the State in Germany and the United States was ably pointed out by Sir Norman Lockyer in 1903. Sir James Crichton Browne has repeated the warning more recently. Speaking at the University of Leeds at the beginning of the month, he said:—

> "England has been remiss of late in perceiving and promoting those interests that hinge on scientific and medical research. In this direction Germany has stolen a march upon us, for the various Governments in that Empire have unstintedly provided their universities with fully-equipped research laboratories, organised and conducted by professorial directors."

The importance of securing this exercise of what should be regarded as a State prerogative consists, not only in ensuring an immediate and adequate supply of institutions of university standing, but—in an equal degree—in realising the right atmosphere in the university when it gets itself established. The parochial spirit is fatal to university development. The boy proceeding from the school to the university should pass from an institution dominated by local aspirations to one imbued with Imperial instincts, where thought is unfettered and ambitions are free to soar. Sir James Crichton Browne expressed the same thought very distinctly at Leeds when he remarked:—

> "It would be a misfortune to a boy to pass from a secondary school to a university in the next street, where he would meet as his fellow-students only his old schoolfellows, and where, however amply fed with knowledge, he would still be surrounded by the same traditions and associations and shop amongst which he had been brought up. A provincial university is a contradiction in terms. What is wanted is a group of territorial universities, each with distinctive features of its own, specially adapting it to its environment, but all affording the most liberal instruction, the finest culture, the best intellectual discipline of the day, and collectively meeting the higher educational needs of the whole country."

Another point made by Lord Strathcona may be considered profitably in conclusion. Speaking of American universities, the Chancellor said:—

> "They found out long ago that law and medicine and theology are not the only legitimate points of academic study; and in their faculties of applied science they are training their young men to do work that is most loudly called for. They have never accepted the view that universities must necessarily be institutions cloistered and apart from the main current of public life and service. On the contrary, they make a training for citizenship and for public usefulness the basis and foundation of much of their educational activity. The reward they have is that —fully as much as we do here—they find their *alumni* in every walk of life, not in the 'learned professions' only; and some of the most notable benefactions which the American universities have lately received come from men whose desire it is to connect them still more closely with practical work."

In other words, a university training is valuable in every department of work. The culture which is the gift of every living university to each of its sons is capable, in addition to equipping for remunerative labour, of affording intellectual guidance in all life's difficulties, of encouraging individuality, and of promoting a symmetrical intellectual development. Besides providing men able to compete worthily in the international struggle for industrial supremacy, the modernised university, which is actually the crown and summit of a sanely planned system of secondary and elementary education, will send out men of wide sympathies, above insular prejudices, and in all things dominated by a sweet reasonableness.

NOTES.

THE seventh annual Huxley memorial lecture of the Anthropological Institute will be given on Thursday, November 1, at 8.30 p.m., in the theatre of the Civil Service Commission, Burlington Gardens, W., when Prof. W. M. Flinders Petrie, F.R.S., will deliver an address on "Migrations." Tickets can be obtained on application to the secretary of the institute, 3 Hanover Square, W.

THE inaugural meeting of the session of Guy's Hospital Pupils' Physical Society will be held on Saturday next, October 13, when Prof. T. Clifford Allbutt, F.R.S., will deliver an address on "Words and Things." The chair will be taken at 8 o'clock by Sir Samuel Wilks, F.R.S.

DR. THOMAS HARRISON, formerly Chancellor of the University of New Brunswick, died on September 18 in Fredericton, at the age of sixty-eight. He was professor of mathematics in the University from 1885 to 1892, and Chancellor from 1892 until last August, when he retired on a Carnegie pension.

A REUTER message from Wellington, New Zealand, reports that a monument to Captain Cook was unveiled on October 8 in the presence of a large gathering of both races at Poverty Bay, on the east coast of the North Island, at the spot where the explorer first landed.

WE learn from the New York correspondent of the *Times* that Sir William Perkin was the guest of honour at Delmonico's on October 6 at a dinner given by four hundred American chemists and manufacturers of chemical products. Prof. Chandler presided, and many well-known Americans were among the guests. Dr. Nichols presented to Sir William Perkin the first cast of a gold medal to be known as the Perkin medal, and to be awarded each year to some American chemist who has distinguished himself in the field of research. Another gift to Sir W. Perkin was a silver service as a personal tribute from the chemists and manufacturers who were present.

IT was mentioned last week (p. 545) that the Governor of Hong Kong had appointed a committee to inquire into the alleged failure of the observatory to give warning of the violent storm that burst over the colony on September 18. According to a Laffan message from Hong Kong on October 8, the report of Zi-ka-wei Observatory at Shanghai shows that a published warning was issued against the passage of a typhoon two days before it struck Hong Kong. The latter place was not warned because for years the Hong Kong Observatory has refused to exchange warnings with the Jesuit observatories at Shanghai and Manila.

IT is announced in the *Lancet* that the first International Congress on Alimentary Hygiene and a Rational Diet for Man, to be held at the Paris Faculty of Medicine on